

Volume 46

MARCH, 1960

Number 3

# Lubrication

A Technical Publication Devoted to  
the Selection and Use of Lubricants

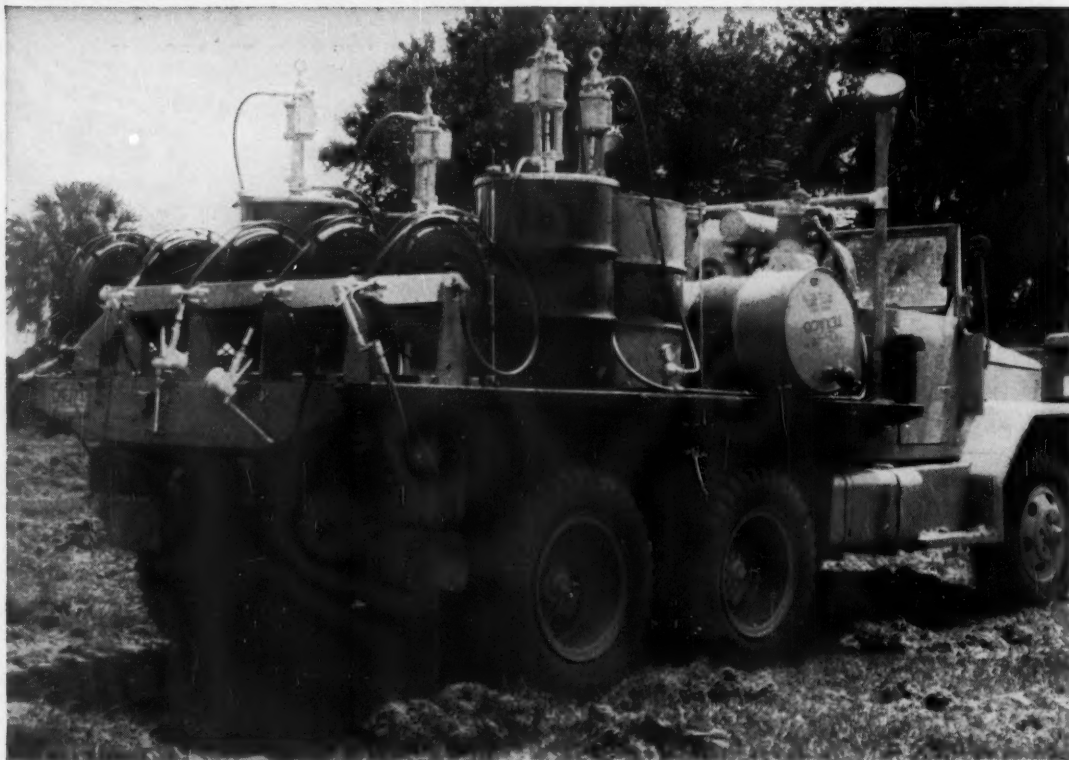
*This Issue*  
★

MOBILE  
LUBRICATION  
EQUIPMENT



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TEXACO PETROLEUM PRODUCTS

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# LUBRICATION

A TECHNICAL PUBLICATION DEVOTED TO THE SELECTION AND USE OF LUBRICANTS

Published by

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Vol. XLVI

March, 1960

No. 3

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## Mobile Lubrication Equipment

THE simplest forms of mobile lubrication equipment are the conventional grease gun and the familiar "squirt" can of oil. Both are still in wide use today and provide adequate means to a limited field of application. Their limitations of capacity and flexibility confine their use to applications where economics do not justify the investment in power dispensing equipment. Their use also requires that bulk lubricant supplies be within easy access and equipped with suitable filling devices.

Large lubricant requirements preclude time-consuming hand application since the cost of the labor is considerably more than the cost of the lubricant. The continuing rise in labor costs, as well as the high price of modern precision machinery, has highlighted the necessity for the proper application of high quality lubricants in the shortest possible time.

Many of today's complex multi-purpose machines operate far from a base of supply under severe conditions of load, weather and terrain. To perform at top efficiency hour after hour, they must receive their daily diet of fuels and lubricants. Circumstances may vary but the requirements are always the same. Developments in mobile fuel and lubrication equipment have provided the means to meet these requirements on time, at the right place, in clean condition and in the right amounts.

### PREVENTIVE MAINTENANCE

Preventive Maintenance is the first and foremost requirement in the proper care of equipment. To ignore the basic concept of Preventive Maintenance

is to invite unnecessary repair with its ever present companion, high cost of down time.

The value and importance of the principles has been widely recognized and used in many fields. Many industries issue specific instructions on the subject as does the Department of the Army whose 450 page manual covers the proper practices with respect to our military equipment. Such evidences of its value would indicate that the individual operation, however small, can ill afford not to subscribe to the same concept.

Preventive Maintenance can be described in five short words, STOPPING FAILURE BEFORE IT STARTS. Proper attention given to lubrication, minor adjustments and repairs is the surest way to prevent the latter from becoming the major items of overhaul. Definite scheduling of maintenance procedures with proper interested supervision and conscientious execution of the work will pay for themselves many times over in efficient, trouble-free operation of equipment. The basic and most important tool in a program of Preventive Maintenance is PROPER LUBRICATION.

The proper selection of lubricants is the foundation of an effective program. However, misapplication, mishandling or contamination will quickly nullify the best of selections. A high speed heavily loaded roller bearing won't operate very long with a charge of tacky gear lubricant. The built-in excellence of a lubricant is useless when improper care permits the entrance of dirt, water and other contaminants into a critical bearing or a close fitting

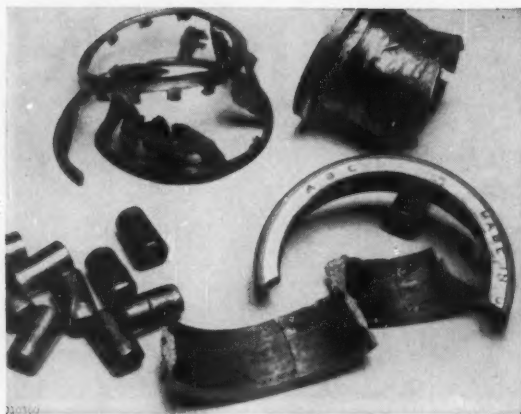


Figure 1 — A result of contaminated grease.

hydraulic system with resultant rapid wear and failure. The results of lubricant contamination are quickly evident. Note the remains of the roller bearing seen in Figure 1 which failed after only 30 hours operation because of dirt-contaminated grease.

Maximum benefits from a program of Preventive Maintenance require the cooperation of management, supervision, shop forces and the operators of the machinery. Like the proverbial chain, Preventive Maintenance is only as strong as its weakest link. The equipment manufacturer and the lubricant supplier know well the advantages of Preventive Maintenance and are willing cooperators in establishing a well grounded program to suit the individual requirements of different operations.

### THE HEAVY CONSTRUCTION INDUSTRY

There are few industries where Preventive Maintenance and its major tool, Lubrication, is of greater importance than in the heavy construction industry.<sup>1</sup> Its equipment is seldom idle, almost never stationary, and requires daily attention at or near its work location. The nature of the operation has dictated that effective lubrication can best be accomplished by the use of mobile dispensing equipment. This industry with its vast amount of equipment is the major user of mobile lubrication equipment.

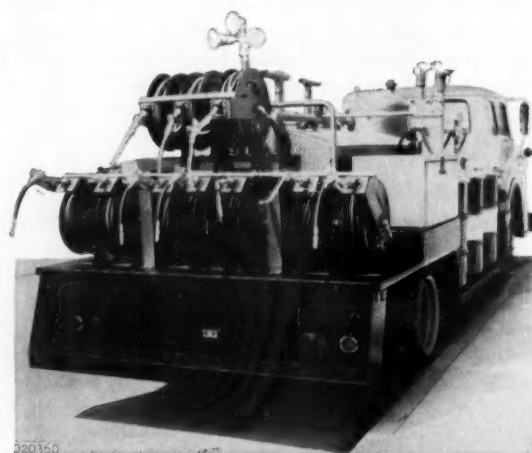
Heavy construction in the United States accounted for nearly half of the 54 billion dollars spent in 1959 for new construction and no reduction is in sight. In fact, new highways and reclamation projects alone in the next ten years will cost over 100 billion dollars and will involve handling 28 billion cubic yards of dirt. The earth-moving giants that will do this work will consume billions of gallons of fuel, millions of gallons of lubricating oil, and millions of pounds of grease. In one form or another heavy equipment needs will be met through the use

of mobile dispensing equipment.

Unlike many industries, the contractor must bid for his work. His estimates of cost must be based on sound judgment and good business practice in order to realize a profit rather than a loss. Investments in heavy equipment run in the millions of dollars for individual contractors with single units costing as high as \$90,000. The magnitude of such investments make it imperative that equipment operate at a constant high level of availability and performance.

It is not uncommon for a \$10,000,000 project to involve 50 to 100 pieces of major equipment. The down time of a single piece will run from \$25.00 per hour upward. Failure of a critical shovel or loader will result in idle time for other equipment that quickly runs into thousands of dollars. Can any contractor, big or small, afford the "luxuries" of poor maintenance and inadequate lubrication?

Every contractor wants the maximum capacity from his equipment, and in many cases, a little bit more. Often to accomplish this he will modify his equipment to carry higher payloads. For example, the application of sideboards to a scraper can increase the payload from two to four cubic yards. At a moderate thirty cents per yard, this means a savings of approximately a dollar per trip. The use of a push tractor to assist the scraper to load fully and quickly is a common practice and can result in a loading rate of a cubic yard per second. Proper balance between the different types of equipment can result in a practical assembly line operation. This constant heavy work day after day under severe operating conditions demands the best in lubrication practice to keep the wear of the equipment to a minimum. The farsighted contractor has recognized these requirements and has acquired the



Courtesy of Lincoln Engineering Co.

Figure 2 — A modern lubrication truck. Note the step-down bed frame which provides easy loading of drums, and additional hose reels for special lubricants.

<sup>1</sup>See LUBRICATION, March 1956, July 1957.



## LUBRICATION



*Courtesy of Quiggle and Sutliff*

Figure 3 — Lubricating equipment in the field.

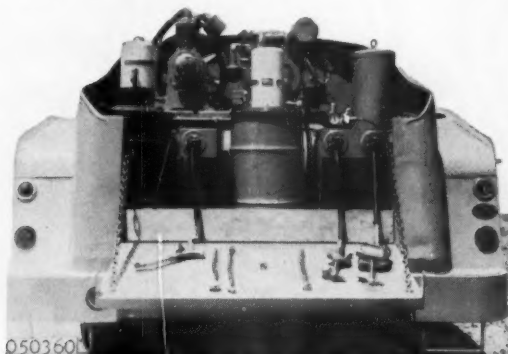
proper lubricants and dispensing equipment tailored to fit his particular type of operation.

### The Lube Truck

The contractor has found by experience that lubrication by hand is costly and time consuming, particularly when lubrication is done on an overtime basis by the machine operator. The well-equipped lube truck with a competent operator provides the surest method of lubrication at a minimum cost.

Fundamentally all lube trucks perform the same function regardless of their physical appearance. They must be able to service the equipment on a daily basis, or more frequently when necessary, regardless of the location of the equipment in the field. The following items will be found on practically all well equipped lube trucks whether built commercially or by the contractor. Modifications in detail vary to suit the individual contractor's requirements.

1. Drums or tanks containing the products of a simplified lubrication plan with pumps of proper capacity for dispensing them. Auxiliary drum covers provide weather and contamination protection as well as anchorages for the tie down cables. Drums, tanks, and locations should be well marked to avoid misapplication.



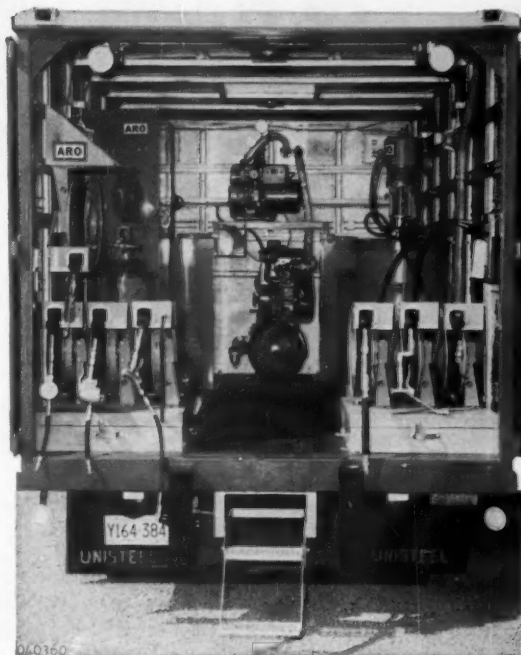
*Courtesy of J-8 Equipment and Supply Company*

Figure 5 — A tank wagon modified to serve a dual purpose.

2. A supply of water for radiators. Water is usually blended with rust inhibiting soluble oil or anti-freeze.

3. Properly identified hose and reel assemblies with metering devices, if desired.

4. Small supplies of solvent (for air filter cleaning), miscellaneous specialty lubricants and brake fluid.



*Courtesy of Aro Equipment Corp.*

Figure 4 — A van type lube truck provides both complete service and protection against the weather.

5. An air compressor to operate the dispensing pumps and inflate tires.

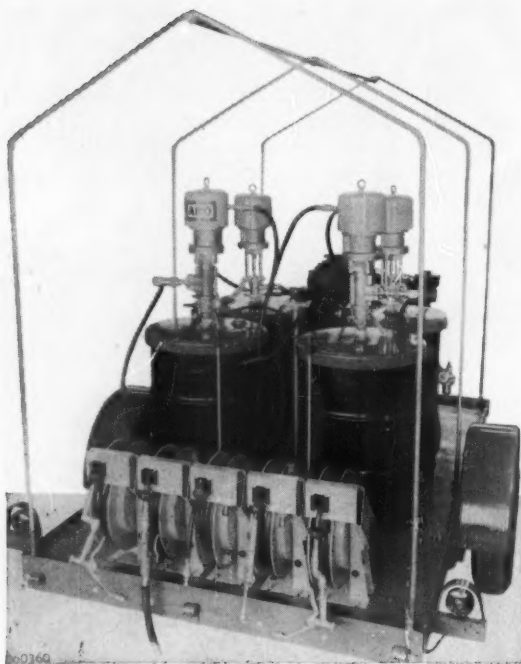
6. A generator to operate the floodlights.

7. Optionally a supply of fuels for "topping" i.e. refilling fuel tanks.

8. Miscellaneous tools, oil and fuel filters, fan belts, grease fittings and adaptors will usually be found in a body-hung cabinet.

In general the basic lube rig is an assembly of standard commercial dispensing equipment modified to fit the specific requirements of the user. The equipment can be mounted on a variety of different chassis as shown in Figures 2 through 6. The contractor can also assemble his own equipment as seen in Figure 7 or he may purchase a skid mounted rig, similar to the one in Figure 8, for application to a flat bed truck.

The Corps of Engineers, United States Army, operate and maintain construction equipment throughout the world. Their construction equipment is lubricated and serviced by the standardized

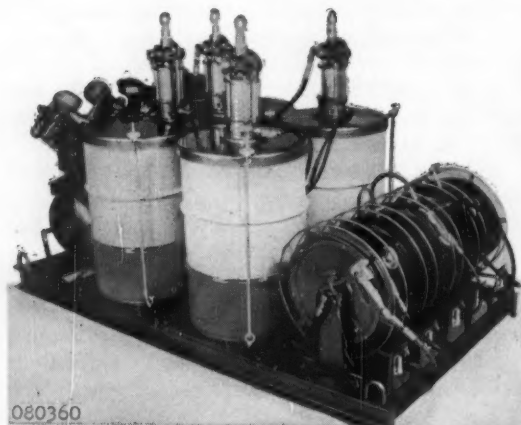


*Courtesy of Aro Equipment Corp.*

Figure 6 — Maximum mobility with minimum cost is provided by a trailer mounted rig. Note the tarpaulin frame for weather protection.

skid-mounted rig shown in Figure 9. This rig has been designed and constructed to operate in all extremes of climate from the tropical heats to the arctic colds.

The unit is equipped with three pump operated 650 pound capacity tanks for engine oil, gear lubricant, and grease. It is provided with an engine-driven air compressor which supplies air for the lubricant dispensing pumps, the inflation of tires



*Courtesy of Stewart-Warner Corp.*

Figure 8 — A complete skid-mounted lubrication rig ready for use in either a truck or stationary location.



*Courtesy of Schmidt Construction Co.*

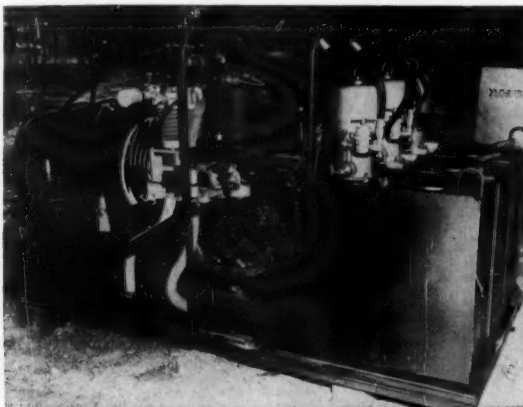
Figure 7 — A contractor often assembles his own lube truck.

and any other accessories which require the use of air. The arrangement is compact and so designed that it can be transported in a standard 1½ ton military cargo carrier.

### Fuel and Lubricant Requirements

Major projects are seldom located in an area convenient to the basic needs of fuel, lubricants, and water. Water may be near at hand or it may have to be trucked in by tank wagon (a highly expensive operation). Fortunately the fuel and lubricant supply can be arranged for with much greater assurance. The site of the project is reviewed by the lubrication engineer and the contractor representative of the petroleum supplier. After consultation with the contractor or his superintendent, and utilizing the knowledge of the types of equipment to be used, a program is formulated that will serve the best interests of the contractor.

Contractors, equipment manufacturers, and the petroleum industry have worked closely over the years to provide the best lubrication. Constant development and recognition of this requirement have produced simplified lubrication plans which pro-



*Courtesy of Corps of Engineers, United States Army*

Figure 9 — This type of skid-mounted service unit lubricates Uncle Sam's construction equipment throughout the world.

# LUBRICATION

## Lubrication Chart

Check-Chart

SERVICE AT EACH ARROW POINT  
AT HOURLY INTERVAL SHOWN

CAUTION Lubricate Dotted Arrow Points on Both Sides of Tractor

Lubricant Hours

Generator Drive (if equipped) . . . . . CL 240

Fitting and plug, lubricate thru fitting to plug level

Plug only . . . . . final drive grade MP 240

Power Take-Off Coupling (fitting) . . . . . CL 60

241 series . . . . . CL 60

Water Pump Housing (plug) . . . . . CL 240

Engine Front Support (fitting) . . . . . CL 60

Ignition Cut-Out Switch, sparingly MG 960

Injection Pump . . . . . check level MO★ 10

Generator (oilers) . . . . . sparingly MO 120

Plugs . . . . . MO 480

Air Cleaner . . . . . clean and refill MO★ 10

241 series only. Others located at rear of engine

CRANKCASE . . . . . check level HD★ 10

Distributor (grease cup) sparingly . . . . . CL 120

Plug . . . . . CL 480

To lubricate, remove plug and insert fitting

Wick under rotor . . . . . sparingly MO 480

Brake Pedal Shaft . . . . . CL 60

Clutch Shaft Bearing . . . . . WB 60

Not on models with torque converter

Clutch Rel. Sleeve, foot-operated . . . . . WB 60

2 fittings on torque converter models; clutch release bearing and torque converter input shaft

Clutch, hand-operated . . . . . WB 60

Camshaft, 3 fittings; Release Sleeve, 1 fitting; Release Bearing, 1 fitting

Remove plate to expose fittings

Track Idlers and Rollers

Plug . . . . . final drive grade MP

Lubricate Front Idler and 2 Track Rollers every 120

hours. Lubricate 6 or 7 Track Rollers every 480

hours except lubricate models before Serial No.

8050 and Torque Converter models before Serial

No. 626 every 120 hours

Clutch Pilot Bearing . . . . . WB 60

Torque shaft rear bearing on torque converter models

Clutch Release Shaft . . . . . WB 60

With torque converter . . . . . WB 60

Universal Joints . . . . . CL 60

Clutch Lever or Pedal Shaft . . . . . CL 60

Not on models with torque converter

Transmission Gearshift Pivot . . . . . CL 240

Not on torque converter models. Some with torque

converter have Shifter Cross Bar, 3 fittings, every 60 hours

Track Frame Pivot (plug) . . . . . MP 60

Use final drive grade

Hydraulic Control Levers . . . . . CL 60

TD-24 241 series, no lubrication

Brake Operating Rod Guide . . . . . CL 60

FINAL DRIVE . . . . . check level MP★ 240

Hydraulic System . . . . . check level MO★ 60

Track Frame Diagonal Braces . . . . . CL 60

Not on rigid track frame models

TRANSMISSION . . . . . check level MO★ 240

Fill through filler plate, either side

### TABLE OF CAPACITIES

MODEL	CRANK- CASE Quarts	TRANS- MISSION Quarts	FINAL DRIVE Quarts	HYDRAULIC SYSTEM Quarts	COOLING SYSTEM Quarts	FUEL TANK Gallons
TD-24	30*	192	9 each*	16	148*	85*

\* Includes oil filters

Some, 144 quarts; with torque converter, 152

Effective January 24, 1955, 21 each

241 series, 135 gallons

FOR DETAILED PROCEDURES, REFER TO "SERVICE INSTRUCTIONS" SECTION PRECEDING THE LUBRICATION CHARTS

100360

Check-Chart No. IL-7

INTERNATIONAL • MODEL TD-24; TD-24 241 SERIES

Copyright 1958, The Check-Chart Corporation. Printed in U. S. A.

Courtesy of The Check-Chart Corp.

Figure 10 — The vital equipment lubrication chart contains all necessary lubrication information.

### KEY TO LUBRICANTS

- CL Chassis Lubricant
- HD Heavy-Duty Motor Oil  
(Meeting Specification MIL-L-2104A)
- MG Magneto Grease
- MO Motor Oil
- MP Multi-Purpose Gear Lubricant  
(Meeting Specification MIL-L-2105)
- WB Wheel Bearing Grease

★ For lubricant type and SAE grade, see "Lubricant Grades, Drain Intervals". Change lubricant depending on hours of operation or temperature

### LUBRICANT GRADES, DRAIN INTERVALS

lub. Hr.

AIR CLEANER . . . . . crankcase grade MO 10

Do not dilute. Clean and refill

Service more often in extreme dust conditions

Clean tray every 60 hours. Keep intake cap clean

CRANKCASE

Fuel sulfur content 0.4 per cent or less\*. HD 240\*

For fuels with sulfur content from 0.4 per cent to 0.9

per cent or for severe service, use Supplement 1;

with sulfur content of fuel over 0.9 per cent or for

most severe service, use Supplement 2

\*241 series, drain every 120 hours and use only

Supplement 2 oil

Above +90° . . . . . SAE 50

Not lower than +45° . . . . . SAE 30

Not lower than +32° . . . . . SAE 20

Not lower than -10° . . . . . SAE 10W

Below -10°, 3 qt. kerosene to 27 qt. SAE 10W

When draining, drain oil fillers

Full-flow type filter, when refilling crankcase, re-

move caps and pour 1 quart crankcase oil over

each element; replace caps, then refill crankcase

with 3 quarts less oil

Breather Wash elements . . . . . 240

Located in push rod chamber

FINAL DRIVE . . . . . MP 960

Above +50° . . . . . SAE 140

Above +90°, SAE 250 may be used

Not lower than +20° . . . . . SAE 90

Below +20° . . . . . SAE 80

HYDRAULIC SYSTEM . . . . . SAE 10W MO 960

At time hydraulic system is drained, clean magnetic

plug located on pump housing under generator

INJECTION PUMP . . . . . crankcase grade MO

TD-24 241 series . . . . . 120

TD-24 series . . . . . 240

Do not dilute. Capacity 1/2 quart

TRANSMISSION . . . . . MO 960

Above +50° . . . . . SAE 50

Not lower than +20° . . . . . SAE 30

Below +20°, dilute SAE 30 with not over 10

per cent kerosene

### ADDITIONAL LUBRICATION SERVICE

DEEP MUD OR WATER OPERATION Lubricate Front Idlers, Track Idlers and Rollers more frequently if seals are worn or when tractor is being operated in water or extreme dust conditions

OIL FILTERS

Engine Replace elements . . . . . 480

Hydraulic System

Pressure Line Filter, wash element . . . . . 240

Located on pump housing under generator

Suction Line Filter, wash element . . . . . 960

Located near drain plug

Transmission Wash elements . . . . . 960

241 series wash if transmission oil pressure gage

hand remains in red zone after oil is warm

Filters, located each next to universal joints

### DO NOT LUBRICATE

Starter, Tracks





## LUBRICATION

tion inhibited hydraulic oil is even more satisfactory.

### *EP Gear Oil*

The heavy shock loads and high temperatures usually require an oil meeting the MIL-L-2105 specification and the SAE-90 grade has found favor with most contractors. The GL-4 type may be required for some equipment. Gear lubricant is an important item and should always be discussed with the Lubrication Engineer and equipment manufacturer before installing in equipment, as severe damage can result if the wrong type lubricant is applied.

### *Multi-Purpose Grease*

This product is another major key to simplified lubrication. Today's multi-purpose grease covers wide ranges of temperature, loads, and speeds not believed possible a few years ago. It can be used in applications formerly requiring several specialty greases and often provides lubrication superior to the previously used products. The features of pumpability, compatibility, oxidation and water resistance as well as shear stability are built-in qualities rather than happenstance. A multi-purpose grease is generally of the lithium soap base type and is available in both the NLGI zero and two grades.

### *Track Roll Lubricants*

The "sealed for life" track roller assemblies now available on the newest equipment will relieve the contractor of a heavy burden of lubrication. However, older equipment presently in use must still be serviced and a good track roll lubricant or (in some designs) a good multipurpose grease will provide requisite lubrication and sealing.

Although the above products will cover the majority of equipment, there are always exceptions which must be provided for in any program. The specialty products can usually be incorporated without disturbing the advantages of the simplified program.

### **Lubricating the Equipment**

The job of lubrication to be done effectively and efficiently must be a planned operation. It is of little benefit to have modern dispensing equipment and premium lubricants if critical bearings are missed or neglected. Lax practices lead to repairs. Lubrication charts similar to the one shown in Figure 10 are available (usually from the equipment manufacturer), which indicate the points of lubrication, type of lubricant to be applied, and the frequency of application. The well-trained operator soon commits to memory the details of his equipment but his lube truck will always have the necessary charts conveniently located.

If a contractor is to know and follow the maintenance of his equipment, a concise daily record is necessary. The record need not be complicated but must contain information to identify the unit

served, total engine hours, quantity and type of fuels and lubricants applied, and possibly information on tires, batteries, and inspection. A serviceable type of record card on heavy grease-resistant paper is illustrated in Figure 11. A daily review of the record card will quickly indicate excessive consumption, over or under lubrication, and possible distress of equipment. Equipment identification is usually recorded before servicing begins so no unit will be neglected.

How and when lubrication takes place depends upon the nature of the project. A one-shift operation with mobile-type equipment permits assembly of the equipment in parallel columns near the work site. The lubrication will generally take place at night, thus the need for floodlights (the use of miner's cap lights has been found useful by one large contractor). The one-shift operation permits more time for inspection and minor repairs. Three major pieces of equipment can usually be serviced per man-hour. Many lube trucks are fitted with dual hose arrangements to permit two operators to use the same lubricants, thus doubling the number of units that can be serviced.

A 'round-the-clock operation presents a more complex operation. The lube truck (or trucks) is in continuous operation throughout each shift. The operator must search out each piece of equipment and service it on the spot. One large project involving a high percentage of dump trucks found it more advantageous to establish a stationary lube station along the haul road to service the dump trucks while their lube truck was used to lubricate their heavy shovels and drill rigs at the work sites.

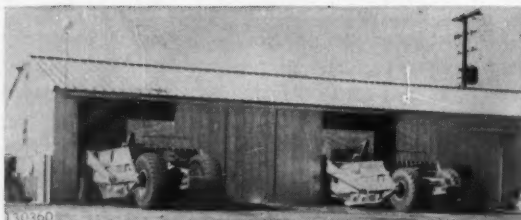
Figure 12 illustrates the opposite condition where the size and relative immobility of the equipment requires that it be lubricated on the job. With just eight lubricants this contractor can service this dragline and all other pieces of his equipment with the same lubrication rig.

Proper servicing in the field involves more than just the application of lubricants. Air filters are usually cleaned and oiled daily. Oil drains and oil filter changes are made between 100 and 200 hours depending upon the severity of the operation and fuel filters are changed between 200 and 500 hours. A 5-day week operation utilizes Saturday for much of this type work.

### **General Maintenance Facilities**

At any extensive operation major overhaul usually proceeds on a scheduled basis and contractors provide facilities to handle their equipment. Machines will wear at different rates depending upon the severity of the work but units will generally require major repairs between 2000 and 3000 hours of operation.

While some maintenance is done outdoors, most



*Courtesy of Winston-Green Construction Company*

Figure 13 — Field maintenance shop with two big scrapers undergoing overhaul.

big projects will set up a suitable facility similar to the building shown in Figure 13. It will have an operating bay and a storehouse for expendable parts. Adjacent to the shop will usually be a shed for the storage of tires and lubricants. The size of maintenance forces will vary according to the type of equipment in use. One contractor has a 30 man crew maintaining approximately 50 major pieces and 40 utility pieces in good repair.

Tires are a big item of expense particularly in rough terrain. New tires for big scrapers like those in Figure 13 cost in the \$2000-2500 range and can usually be recapped for about \$600. Total life including recaps seldom reaches 2000 hours. Detailed costs of maintenance are vague and kept by few contractors, but the national average estimated by the Department of Public Roads is 21% of the construction dollar.



*Courtesy of Quiggle and Sutliff*

Figure 15 — Refueling a grader.

### Fueling Facilities

Prior to the arrival of the contractor's equipment, fuel must be available at strategic locations and in sufficient quantity to maintain the operation. A mobile fueling unit such as seen in Figure 14 will provide 1500 gallons of diesel fuel and 500 gallons of gasoline. It is mounted on a rugged frame and can be moved to suit changing operating conditions. The unit is self contained being equipped with a small gasoline engine which operates the fuel pumps to dispense fuel or to load its tanks from a storage facility. It is equipped with sufficient hose to service all types of equipment. A 10,000 gallon skid-

mounted counterpart is used for fueling large tank wagon trucks which fuel equipment in the field. The skid-mounted tank is located convenient to an access road so it in turn can be supplied with fuels. Large widespread operations usually use several tank wagon trucks to keep the equipment supplied. Figure 15 shows such a field tank wagon fueling a piece of equipment in the field.

Each job has its own requirements for fuel storage and dispensing. Some projects lend themselves to a



Figure 14 — A complete self contained fueling facility ready for immediate independent use in the field.

gravity type of system while others find the best solution to be a rough duplicate of the familiar roadside service station shown in Figure 16 with its conventional gasoline pump.

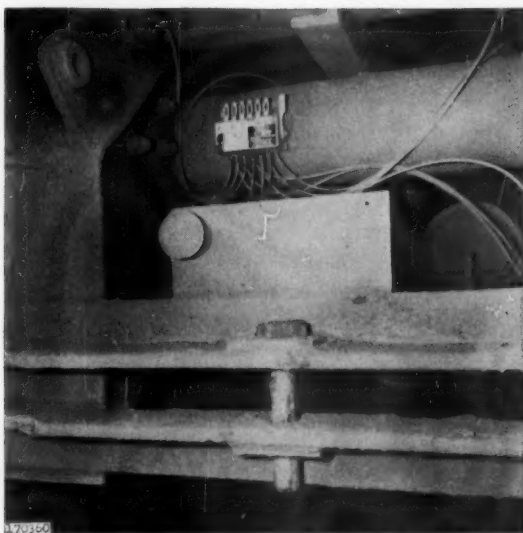
Diesel Fuel specifications generally follow the ASTM Grade 2-D with some contractors requiring a more stringent sulphur limitation than the allowable 1% maximum. Pour point is important to a contractor who must start and operate equipment in sub-freezing temperatures: it is of little importance to the operator in warm climates. The petroleum supplier will take operating conditions into consideration when he is arranging for the fuel requirements of the job.



*Courtesy of Northwestern Engineering Company*

Figure 16 — A field fueling station on the construction site.

## LUBRICATION



*Courtesy of The Farval Corporation*

Figure 17 — Installation of a centralized lubrication system on a heavy dump truck. One application of a lubricant gun to the manifold delivers measured amounts of grease to 12 different lubrication points.

The majority of gasoline requirements are met by the regular grade prevailing in the area, especially since today's regular is the premium of yesterday. Gasoline consumption varies widely depending on the type of work done and the equipment used. Fifty percent of fuel used in a highway project may be gasoline, while a dam project may require only enough to start the diesel engines and fuel the utility trucks.

### Fuel and Lubricant Consumption

The earth moving contractor is a heavy user of petroleum products. It is not his major item of expense but will constitute approximately four percent of the contract dollar. It will roughly divide into three percent for fuel and one percent for lubricants. The success of the venture can well depend upon the proper use of the lubricant one percent, as it most directly affects the expense of maintenance.

Facts can be interesting and an example of the actual amounts of fuels and lubricants used in a particular dam construction project may prove informative. This project involved the moving of 12,000,000 cubic yards of material with over 50 major pieces of equipment and cost in the range of \$10,000,000.

Gasoline	250,000 gallons
Diesel Fuel	2,300,000 gallons
Diesel Engine Oil	77,000 gallons
Hydraulic Oil	20,000 gallons
Air Cleaner Oil	11,000 gallons
Multi-purpose Grease	87,000 pounds

Gear Lubricant 121,000 pounds

Practically all fuels and lubricants were supplied through mobile dispensing equipment.

### MOBILE AND CENTRALIZED LUBRICATION

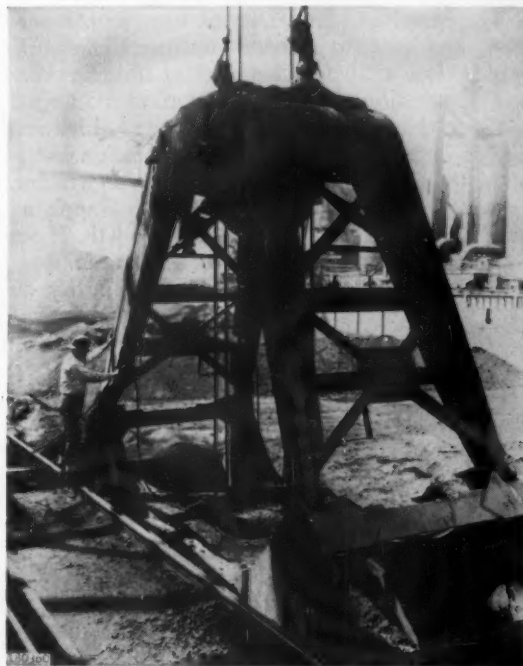
Centralized lubrication<sup>2</sup> systems have provided the answer to many complex problems of lubrication in many types of industry and are rapidly expanding as machines become more complicated.

Figure 17 shows the application of a centralized lubrication system to a heavy construction dump truck. The metered manifold distributor located on the undercarriage has feedlines branching out to lubricate critical bearings with metered amounts of lubricant. Several manifolds conveniently located will permit the greasing of the truck in a matter of minutes and eliminate the necessity of searching out, cleaning and individually lubricating a large number of fittings.

The lubrication of the huge ore bridge bucket seen in Figure 18 would be a difficult and time consuming operation were it not centrally lubricated. The application of a high pressure grease gun to the conveniently located master distributor assures the proper lubrication of the many "out of reach" bearings in a matter of minutes.

These are but two examples of the many types of

<sup>2</sup>See LUBRICATION, August 1957.



*Courtesy of Trabon Engineering Corporation*

Figure 18 — A large ore-bridge bucket is quickly and easily lubricated by means of a centralized lubrication system and mobile dispensing equipment.





Courtesy of Balcrank Inc.

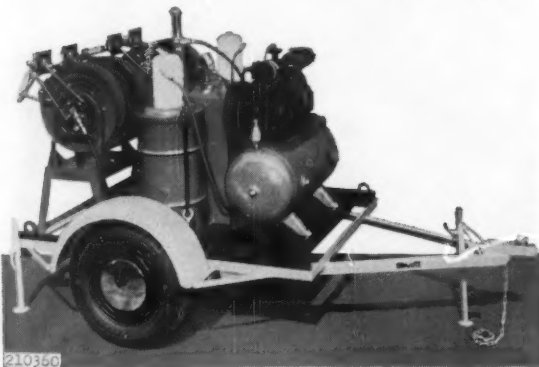
Figure 19 — A convenient type of high pressure grease gun and filler pump for farm equipment.

application where the combination of mobile and centralized lubrication can result in improved lubricant practice and economics.

### LUBRICATION ON THE FARM

The individual farmer is his own maintenance man as well as the manager and the laborer. He spends close to 20% of his working time servicing and transporting his tractor and implements around the farm. He may be well aware that good lubrication is important to trouble free operation but is often thwarted in his efforts by adverse weather, harvest demands and the difficulties of applying lubricants amid mud, dirt and high growth. It can well be said that he does the best that he can.

The small farmer finds it hard to justify an



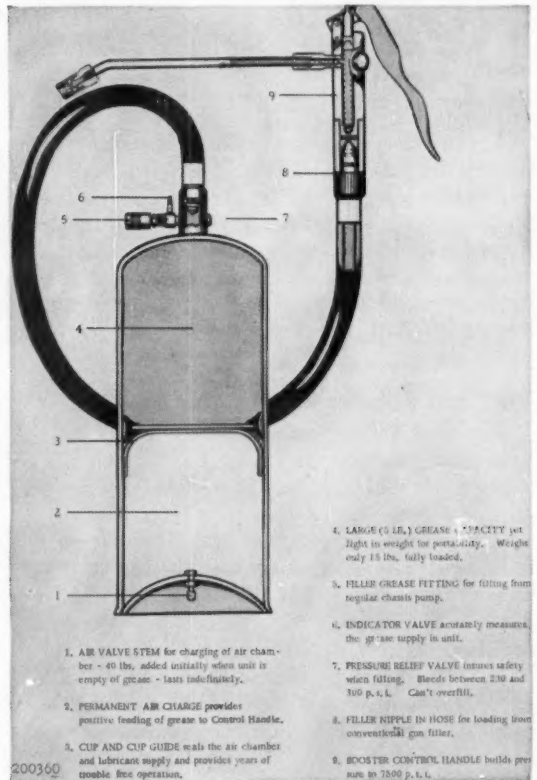
Courtesy of Lincoln Engineering Co.

Figure 21 — A compact trailer-mounted lubrication rig for general field use.

investment in power equipment so he relies upon the familiar hand gun and filler pump for his main tools of lubrication. One type of this popular combination will be seen in Figure 19. Another type grease gun that combines flexibility with portability will be noted in Figure 20.

On the other hand a large farm operation will involve 50 to 100 pieces of equipment operating in an area of several thousand acres. Much of this equipment will be power operated and will require daily fueling and lubrication. While new farm equipment has a high percentage of sealed bearings, many critical bearings are still in need of daily attention.

The problem of lubricating heavy farm machinery that is in operation over a wide area is practically identical to that of servicing heavy construction equipment and has been solved in the same manner. The well equipped power operated lube truck manned by a trained operator has freed the



Courtesy of Aro Equipment Corp.

Figure 20 — A compact high pressure portable grease gun.

machine operator from wasting productive time by lubricating with hand dispensing equipment.

Truck arrangements similar to those used by the construction industry will also be found operating on the large farm. Times of peak production may require the services of a second truck or a trailer



## LUBRICATION



*Courtesy of Westinghouse Electric Corporation*

Figure 22 — Factory machine lubrication cart. Note that the careful lubrication man is consulting a lubrication chart to insure that this boring mill will receive the correct types and amounts of lubricants.

rig similar to the one in Figure 21. The trailer rig may also be used advantageously to service units operating in a small area. Again the use of a minimum number of lubricants is highly advantageous. A heavy duty motor oil, a premium hydraulic oil, an EP gear lubricant and a multi-purpose grease will satisfy the lubricant requirements of practically all of the equipment.

### LUBRICATION IN THE FACTORY

Maintenance and lubrication of a wide variety of different types of machinery has been a problem to industry for a long period of time. Organized Plant Lubrication<sup>3</sup> has resulted in more positive programs of lubrication and a corresponding improvement in maintenance and output. Central lubrication systems play an increasing part in providing positive periodic lubrication but many machines still require personal periodic attention. Mobile lubrication equipment plays an important part in servicing the many individual machines in this category.

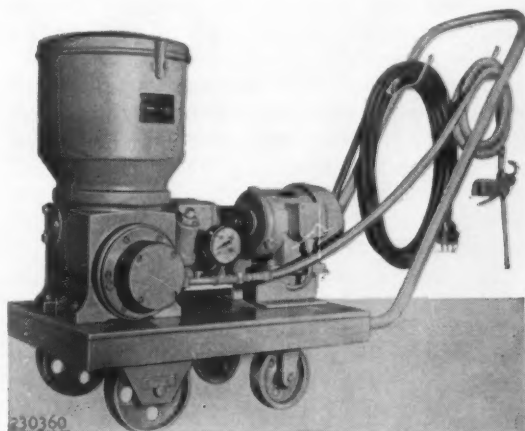
The institution of organized programs has relieved the individual foreman and machine oper-

ator of much of the responsibility of lubrication and assigned it to a trained lubrication man. Several important requirements are necessary for such a program to be effective. The lubrication requirements of each machine must be known and catalogued. The number of lubricants must be reviewed and reduced to a minimum. The trained lubrication man must have available in convenient form the name and location of each machine, the location of the lubrication points, the type and grade of lubricant to be used, the frequency of application and the amount to apply. He must also be provided with the proper equipment to perform his job.

The lube cart seen in Figure 22 has been designed to provide the means for servicing a variety of machines with the proper lubricants. The necessary oils are carried in long spout oil cans neatly racked and the greases are contained in portable dispensing pails both accessible and properly identified. Drawer space is provided for machine lubrication charts as well as small tools and lubrication fittings. The built-in container over the wheels provides space for wiping rags. The top of the cart serves as a writing or working surface. Supplies of lubricants carried are usually sufficient to lubricate about half of the assigned machines before replenishment.

The job of restocking the lube cart must be reasonably quick and easily handled. The use of air-operated transfer pumps for grease and valve-controlled spouts on the oil drums assure quick refills and keep the lubricants from becoming contaminated.

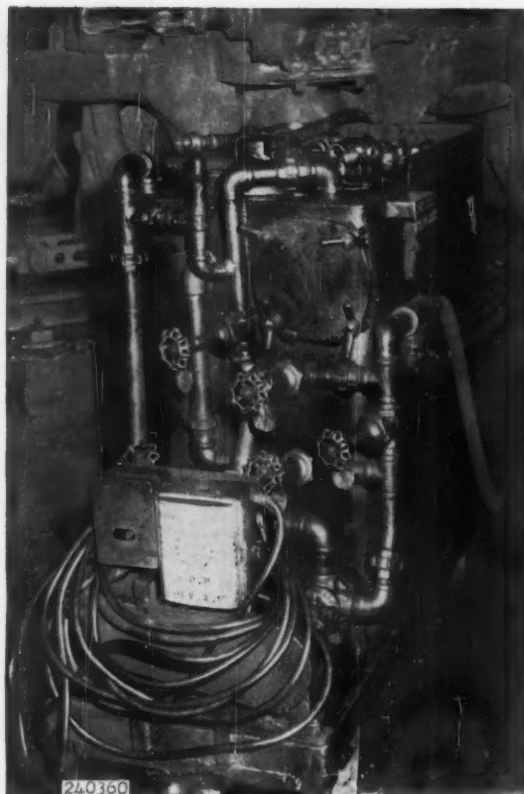
Figure 23 shows an electrically operated grease dispensing unit for quickly lubricating many points using the same type of grease. Figure 24 illustrates an electrically operated oil dispensing unit for quickly filling large capacity diesel locomotive crankcases.



*Courtesy of Research Appliance Co.*

Figure 23 — An electrically driven grease pump and gun for factory use, with narrow maneuverable carriage.

<sup>3</sup>See LUBRICATION, July 1958.



*Courtesy of Louisville and Nashville Railroad Co.*

Figure 24 — A mobile tank and electrically driven pump used to refill crankcases of diesel locomotives.

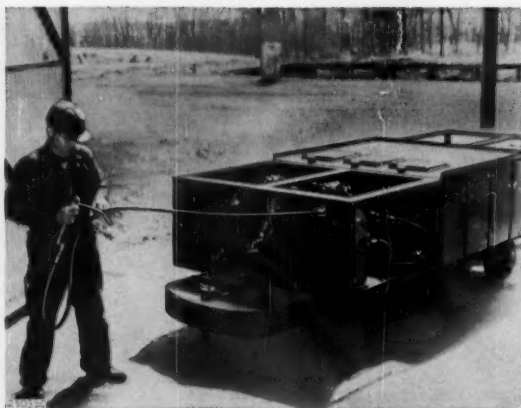
### LUBRICATION UNDERGROUND

Beneath the surface of the earth are machines working in mines that are as complex as any that are seen above the ground. They extract the mineral products vital to the economy of the nation. Modern mining machinery<sup>4</sup> costs upward to \$100,000 a unit and must justify its cost by steady and efficient production. Like all types of machinery, it must be periodically lubricated to provide smooth constant operation with minimum wear. Electric motors supply the power and hydraulic mechanisms actuate the powerful movements. Precision gears and bearings are constantly under a variety of severe shock loads as the machines chew their way forward in a wet humid atmosphere laden with coal and rock dust.

The size of mining machinery and the difficulty of movement underground forces it to remain at the working face of the mine. It is here that it must receive its maintenance and lubrication. It is readily apparent that lack of lubrication or improper application resulting in failure will make replacement or repair both difficult and expensive.

Recognition of the vital part played by lubrication

<sup>4</sup>See LUBRICATION, June 1956.



*Courtesy of Lincoln Engineering Co.*

Figure 25 — Lubrication car for coal mining machinery. Note extremely low headroom requirement.

tion has led many mine operators to assign trained personnel to lubricate the machines properly and expeditiously. The lube man is supplied with lubrication charts and a lubricant car, either self propelled or towed (see Figure 25) which can go directly to the working face to lubricate the machines. Such equipment is reported to reduce time for lubrication to a quarter of that spent with conventional hand equipment.

The car is supplied from a central storage point and can be loaded directly from the suppliers containers. The car carries a tool kit and necessary replacement fittings to maintain the lubrication points in good order.

Space limitations underground again demand that the number of lubricants handled be kept as low as possible and manufacturers of mining equipment have consolidated requirements to a practical minimum. Generally, a premium quality hydraulic oil, one grade of a high quality EP gear lubricant, and a high quality multi-purpose grease will cover most requirements. As in other industries, the qualified lubrication engineer can recommend the proper types of lubricants for top performance.

### SUMMARY

Mobile lubrication equipment has provided a highly successful method of lubricant application to a wide variety of equipment. Because of the nature of its operations the heavy construction industry has been the major user of this method of lubricating equipment.

The development and improvement of multi-purpose lubricants has facilitated the development of simplified lubrication plans which will meet the major requirements of most industries with six or less products. These plans coupled with mobile lubrication equipment have provided effective tools for Preventive Maintenance.



## Hats off to the profit makers!

Maintenance departments are major profit makers. Here's why:

A 10% reduction in maintenance costs can result in a 4% jump in profits in the average plant — according to latest Commerce Department figures.

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LUBRICATION IS A MAJOR FACTOR IN COST CONTROL





## Texaco Plan lets White Oak lube rig handle all field lubrication

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RIVERTON, CONN.—White Oak Excavators, contractors for Connecticut's Hogback reservoir dam to supply water for the greater Hartford area, have found that the Texaco Simplified Lubrication Plan makes their truck-mounted lube rig more useful than ever before.

"The Texaco Plan is really essential to getting the best use of our lube rig," says John Toffolon, one of White Oak Excavators owners. "Our Texaco Plan calls for just six lubricants to handle everything on the spread. We can take our whole lubricant inventory right out into the field. That's especially important to us because we use equipment made by practically every manufacturer."

Using no more than six lubricants on this

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